DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/28/2011 has been entered. Claim 1 was amended. Claims 3, 5, 6 and 9 were cancelled.

2. The texts of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on 5/13/2009.

Abstract

3. The abstract of the disclosure is objected to because it includes improper grammar. For example, the abstract recites, "… a sodium-sulfur battery consisted of…" and "…and liquid electrode which sodium salt and organic solvent such as gyrmids or carbonates are soaked in cell guard…" among other errors. Correction is required. See MPEP § 608.01(b).

Specification

4. The disclosure is objected to because of the following: lack of proper idiomatic English. A substitute specification in proper idiomatic English and in compliance with 37 CFR 1.52(a)

and (b) is required. The substitute specification filed must be accompanied by a statement that it contains no new matter. Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The claim rejection under 35 U.S.C. 112, first paragraph, on claims 1 and 5 are withdrawn as the claims have been either amended or cancelled.

6. Claim 1, and thus dependent claims 2, 4, 7 and 8, are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specifically, claim 1 has been amended to recite that a first discharging capacity of the battery is at least 100 mAh/g based on the mass of the sulfur compound and wherein a discharging voltage range of the battery is between 0.1 V and 2.4 V. The claim recites that the sulfur compound is selected from the group consisting of NiS, FeS_2 and PbS. The first discharge capacity of 100 mAh/g with a discharge voltage range of 0.1-2.4 V is not supported in the written description or the drawings for each of the aforementioned compounds. Furthermore, none of the Figures show that the discharge voltage reaches 2.4 volts. It appears from the Figures that 2.3 volts is the highest discharge voltage reached for any of the batteries tested (Figure 3), and that was with a specific sulfur compound and percentage thereof. Appropriate correction is required.

Claim Rejections - 35 USC § 102

7. The claim rejections under 35 U.S.C. 102(b) as being anticipated by Zhao et al. (US 2001/0033971 A1) and evidenced by Latturner et al. (US 2010/0047161) on claims 1-4, 6, 8 and 9 are withdrawn as the claims have been amended or cancelled.

All rejections pending from this rejection are also withdrawn due to the dependency nature of the claims on independent claim 1.

Claim Rejections - 35 USC § 102

8. Claims 1, 2, 4 and 8 are rejected under 35 U.S.C. 102(b) as anticipated by Zhao et al. (US 2001/0033971 A1) and evidenced by the Product Data Sheet of Tetraglyme, Novolyte Technologies.

Regarding claim 1, Zhao teaches a nonaqueous electrolyte battery in which the negative electrode can be made of alkali metals such as sodium (paragraph 59). It is well known that sodium metal is a solid and Zhao further gives evidence of this by teaching that the negative electrode is constructed by pressing the metal or the alloy to a current-collecting material (paragraph 60).

Zhao teaches that a liquid electrolyte may be used and an electrolyte salt is dissolved in a nonaqueous solvent (paragraph 62). The electrolyte salt includes sodium salts (paragraphs 66 and 67) and Zhao teaches that tetraglyme may be used as the solvent (paragraph 64). As evidenced by the product data sheet from Novolyte technologies, tetraglyme is tetraethylene glycol dimethyl ether.

Zhao discloses that the positive electrode is comprised of polycarbon sulfide, a conducting aid ("electronic conductor"), binder and a nickel compound as an additive constituent in which the nickel compound may include NiS ("a sulfur compound selected from the group consisting of NiS, FeS_2 and PbS"), wherein the NiS also acts as an active material in addition to the polcarbon sulfide material (paragraphs 53-56).

Zhao does not disclose the first discharging capacity based on the mass of the NiS compound ("sulfur compound") or the discharging voltage range of the battery as claimed; however, as Zhao discloses all of the claimed constituents including a solid negative electrode comprising sodium; a liquid electrolyte comprising a claimed solvent and sodium salt; a solid positive electrode comprising NiS ("sulfur compound"), a conducting aid ("electronic conductor"), and binder, it is the position of the Examiner that the claimed first discharging capacity of at least 100 mAh/g based on the mass of NiS as well as the discharging voltage range of the battery are inherent to the battery of Zhao. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. In re Robertson, 49 USPQ2d 1949 (1999).

Regarding claim 2, Zhao teaches that the sodium of the negative electrode can be sodium metal (paragraph 59).

Regarding claim 4, Zhao teaches that preferable examples of the electrolyte salt to be dissolved in the solvent component includes sodium salts of fluorine-containing compounds such as trifluormethane sulfonate (paragraph 66).

Regarding claim 8, Zhao teaches that the conducting aid can be a carbonaceous material such as graphite and carbon black (paragraph 53).

Claim Rejections - 35 USC § 103

9. Claims 1, 2, 4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (US 2001/0033971 A1) in view of Barker et al. (US 2003/0170542) and evidenced by the Product Data Sheet of Tetraglyme, Novolyte Technologies.

Regarding claim 1, Zhao teaches a nonaqueous electrolyte battery in which the negative electrode can be made of alkali metals such as sodium (paragraph 59). It is well known that sodium metal is a solid and Zhao further gives evidence of this by teaching that the negative electrode is constructed by pressing the metal or the alloy to a current-collecting material (paragraph 60).

Zhao teaches that a liquid electrolyte may be used and an electrolyte salt is dissolved in a nonaqueous solvent (paragraph 62). The electrolyte salt includes sodium salts (paragraphs 66 and 67) and Zhao teaches that tetraglyme may be used as the solvent (paragraph 64). As evidenced by the product data sheet from Novolyte technologies, tetraglyme is tetraethylene glycol dimethyl ether.

Zhao discloses that the positive electrode is comprised of polycarbon sulfide, a conducting aid ("electronic conductor"), binder and nickel compound as an additive constituent in which the nickel compound may include NiS ("a sulfur compound selected from the group consisting of NiS, FeS_2 and PbS"), wherein the NiS also acts as an active material in addition to the polcarbon sulfide material (paragraphs 53-56).

Zhao does not disclose the first discharging capacity based on the mass of the NiS compound ("sulfur compound") or the discharging voltage range of the battery as claimed; however, Zhao discloses that the objective of the invention is to provide a high-capacity nonaqueous electrolytic battery which is excellent in cyclic charge and discharge performance and reliability (paragraph 13). In addition, Barker discloses that it is well known in the art to select specific materials that make up the anode, cathode and electrolyte of the battery to yield batteries having specific voltage and discharge characteristics that can be optimized for particular applications (paragraph 3).

Therefore, it would have been obvious to a person of ordinary skill in the art to optimize the battery of Zhao to have a specific first discharge capacity and discharging voltage range depending upon the power requirement of the particular application because Zhao discloses that the objective of the invention is to provide a high-capacity nonaqueous electrolytic battery which is excellent in cyclic charge and discharge performance and reliability (paragraph 13) and Barker teaches that it is well known in the art to select specific materials that make up the anode, cathode and electrolyte of the battery to yield batteries having specific voltage and discharge characteristics that can be optimized for particular applications (paragraph 3). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.).

Regarding claim 2, Zhao teaches that the sodium of the negative electrode can be sodium metal (paragraph 59).

Regarding claim 4, Zhao teaches that preferable examples of the electrolyte salt to be dissolved in the solvent component includes sodium salts of fluorine-containing compounds such as trifluormethane sulfonate (paragraph 66).

Regarding claim 8, Zhao teaches that the conducting aid can be a carbonaceous material such as graphite and carbon black (paragraph 53).

10. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (US 2001/0033971 A1) and evidenced by the Product Data Sheet of Tetraglyme, Novolyte Technologies as applied to claims 1, 2, 4 and 8 above, and further in view of Choi (US 2002/0037457).

Regarding claim 7, Zhao teaches that the positive electrode may include a binder and teaches that polytetrafluoroethylne may be used (paragraphs 53 and 55). Zhao does not teach polyethylene oxide as the binder to be used; however Choi discloses an electrode in which the binder can be selected from polytetrafluoroethylne or polyethylene oxide (claim 6). Thus, polytetrafluoroethylene and polyethylene oxide are equivalent binding materials in electrodes.

Therefore, it would have been obvious to a person of ordinary skill in the art to substitute polyethylene oxide for polytetrafluoroethylene in the electrode of Zhao as Choi discloses their functional equivalency as binders in electrodes.

11. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (US 2001/0033971 A1) in view of Barker et al. (US 2003/0170542) and evidenced by the Product

Data Sheet of Tetraglyme, Novolyte Technologies as applied to claims 1, 2, 4 and 8 above, and further in view of Choi (US 2002/0037457).

Regarding claim 7, Zhao teaches that the positive electrode may include a binder and teaches that polytetrafluoroethylne may be used (paragraphs 53 and 55). Zhao does not teach polyethylene oxide as the binder to be used; however Choi discloses an electrode in which the binder can be selected from polytetrafluoroethylne and polyethylene oxide (claim 6). Thus, polytetrafluoroethylene and polyethylene oxide are equivalent binding materials in electrodes. Therefore, it would have been obvious to a person of ordinary skill in the art to substitute polyethylene oxide for polytetrafluoroethylene in the electrode of Zhao as Choi discloses their functional equivalency as binders in electrodes.

Response to Arguments

12. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

*Applicant's remaining principal arguments a*re

(a) The solvent is not disclosed in Zhao et al.; thus, the invention defined by the present claims is not anticipated.

In response to Applicant's arguments, please consider the following comments.

(a) The Applicant claims tetraethylene glycol dimethyl ether as a solvent and Zhao discloses the use of said solvent (paragraphs 64 and 72). Specifically, Zhao discloses

tetraglyme which is claims tetraethylene glycol dimethyl ether as evidenced by the product data sheet from Novolyte technologies.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMANDA BARROW whose telephone number is (571)270-7867. The examiner can normally be reached on 7:30am-5pm EST. Monday-Friday, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ula Ruddock can be reached on 571-272-1481. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AMANDA BARROW/
Examiner, Art Unit 1795

/Ula C Ruddock/
Supervisory Patent Examiner, Art Unit 1729